Instruction begins in the first year with examination of the eye and a lecture on various aspects of ocular disease. During the second year, students will receive a refresher lecture and lab on direct ophthalmoscopy as well as a lecture on ophthalmic manifestations of systemic disease and primary ocular disease. During the third year, students are given the opportunity during the surgery clerkship to spend four weeks on the ophthalmology services. In addition, during the third year there are lectures given to students during the Internal Medicine rotations. In the fourth year, a four-week intensive clinical rotation is tailored to students interested in pursuing ophthalmology as a career. Also, research electives are available under the guidance of numerous ophthalmology faculty members for fourth-year students.

Website: [http://ophthalmology.wustl.edu](http://ophthalmology.wustl.edu)

**Degrees & Requirements**

While the Department of Ophthalmology and Visual Sciences does not offer its own degree, some of the department's courses are open to students in the MD and MSTP (MD/PhD) programs. Further information about the MD and MSTP degrees can be found in the Degrees & Programs Offered (http://bulletin.wustl.edu/medicine/degrees) section of this Bulletin.

**Research**

**M50 Ophth 900**

Usha P. Andley, PhD
1114-C McMillan
Phone: 314-362-7167
Molecular basis of cataract; the function of molecular chaperones in cataract; proteomics, imaging and biochemical studies on cell culture and mouse models for crystallin gene mutations linked with cataract; testing drugs to inhibit cataract.

Rajendra S. Apte, MD, PhD
Email (apte@vision.wustl.edu)
Innate immunity and immune effector mechanisms in the retina, oxidative stress and cell death, models of developmental angiogenesis and neovascularization, inflammation and photoreceptor survival, macular degeneration.

Steven Bassnett, PhD
1114 McMillan
Phone: 314-362-1604
Eye development, stochastic models of lens growth, stem cell biology, age-related cataract, UV-induced somatic mutation, ocular manifestations of Marfan syndrome, cell death suppression on the optic axis, cell biology of transparent tissues.

Anjali Bhorade, MD
Phone: 314-362-5343
Evaluating the effect of glaucoma on visual function in older adults in the home. Understanding the relationship between vision and driving in older adults with glaucoma.

Shiming Chen, PhD
618 McMillan
Phone: 314-747-4350
The molecular mechanisms regulating photoreceptor gene expression and the implications in understanding photoreceptor development and disease. We are focusing on three transcription factors, CRX, NRL and NR2E3, linked to photoreceptor degenerative diseases. Molecular genetics and biochemical approaches are used to identify the regulatory pathways associated with each factor. Mouse models are used to understand why mutations in these factors cause disease and develop therapeutic strategies, including AAV-gene therapy.

Steven M. Couch, MD
Email (couch@vision.wustl.edu)
Orbital inflammatory diseases, surgical techniques and novel treatments of periocular/orbital disease.

Susan M. Culican, MD, PhD
1104 McMillan
Email (culican@wustl.edu)
Clinical: development of a low-cost, simple visual function task for screening for macular disorders in the primary care setting. Education: examination of the utility of assessment tools for evaluating resident clinical progression during residency training. Development of new metrics to gauge resident progress.

Philip L. Custer, MD
Email (custer@vision.wustl.edu)

Thomas A. Ferguson, PhD
1207 McMillan
Phone: 314-362-3745
Molecular basis of immune tolerance and how apoptotic cells tolerize the immune response. The role of immune privilege in the pathogenesis of eye diseases such as age-related macular degeneration (AMD). The role of basal autophagy in the cells of the eye by using the cre-loxP system to delete essential autophagy genes from specific cell types in the eye.

Mae Gordon, PhD
Phone: 314-362-3716
Ocular hypertension, glaucoma, keratoconus, adenoviral conjunctivitis, randomized clinical trial methodology, patient-reported outcome measures and measurement reliability.

**George J. Harocopos, MD**  
Email (harocopos@vision.wustl.edu)  
Age-related cataract, ophthalmic pathology.

**Andrew Huang, MD, MPH**  
106 McMillan  
Phone: 314-362-0403  
Ocular surface stem cell biology, molecular therapy for corneal dystrophies and corneal neovascularization, oxidative stress of corneal endothelium, clinical research on dry eye and ocular surface disease.

**Humeyra Karacal, MD**  
Email (karacal@vision.wustl.edu)  
Treatment of uveitis, prevention of cataracts with anti-oxidants, anti-oxidants in age-related macular degeneration, retinal imaging and analysis using data mining techniques, designing OR equipment to facilitate ophthalmic surgery.

**Michael A. Kass, MD**  
Email (kass@vision.wustl.edu)  
Principal Investigator of the Ocular Hypertension Treatment Study (OHTS). Diagnosis, treatment and public health aspects of glaucoma.

**Vladimir Kefalov, PhD**  
625 McMillan  
Phone: 314-362-4376  
Photoreceptor Neurobiology and Retinal Degeneration. We are a sensory neurobiology lab interested in the function of mammalian rod and cone photoreceptors. In addition, we are interested in the mechanisms of neurodegeneration in the retina and are working on developing pharmacological and gene-therapy tools for preventing photoreceptor cell death.

**Daniel Kerschensteiner, MD**  
Email (kerschensteinerd@vision.wustl.edu)  
To understand the principles that guide the assembly of neural circuits and to decipher the way they process information. We would like to understand the principles that guide the assembly of neural circuits in the retina and to decipher the way they process information and hope to identify features of the retinal circuit architecture that perform particular computations and characterize how they arise during development. We then probe underlying mechanisms of circuit assembly and function through genetically targeted manipulations of specific cells in the retina.

**John T. Lind, MD, MS**  
Email (lindj@vision.wustl.edu)  
Glaucoma education, resident education, pharmacologic and surgical treatment of glaucoma, ophthalmic microbiology.

**Gregg T. Lueder, MD**  
Email (lueder@vision.wustl.edu)  
Retinoblastoma, eye misalignment (strabismus), retinopathy of prematurity, abnormal tearing, nasolacrimal disorders, cataracts, glaucoma.

**Peter Lukasiewicz, PhD**  
1003C McMillan  
Phone: 314-362-4284  
Neurotransmitters, synapses, retinal function in health and disease, retinal information processing.

**Todd P. Margolis, MD, PhD**  
Email (margolist@vision.wustl.edu)  
1. Cellular and molecular mechanisms that regulate herpes simplex infection neurons.  
2. Inexpensive telemedicine for reducing blindness in underserved populations.

**Josh Morgan, PhD**  
Email (jlmorgan@wustl.edu)  
Synaptic connectivity of visual circuits. Our goal is to understand the structure, development and pathology of synaptic connectivity that gives rise to vision. Our core approach is to reconstruct neural circuits in the retina and visual thalamus using large-scale 3D electron microscopy.

**John R. Pruett Jr., MD, PhD**  
Email (pruettj@wustl.edu)  
We use fcMRI to study the development of large-scale functional brain networks in infants at risk for autism spectrum disorder. We are specifically interested in fcMRI correlates of visual joint attention. Collaborative projects involve fcMRI studies of visual-motor integration.

**Kumar Rao, MD**  
Email (rao@vision.wustl.edu)  

**Nathan Ravi, MD, PhD, MS, FAAO**  
Email (ravi@vision.wustl.edu)  
Directed toward understanding the pathophysiology of presbyopia and developing medical or surgical treatments for this condition.

**Alan Shiels, PhD**  
1128 McMillan  
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Email (shiels@vision.wustl.edu)  
Molecular genetic mechanisms underlying cataract, glaucoma and associated eye disorders: (1) genome-wide linkage analysis and targeted (exome, amplicon) sequencing for discovery of causative or susceptibility genes, and (2) genotype-phenotype and functional expression studies of naturally occurring and gene-targeted mouse models to characterize pathogenic mechanisms.

**Carla J. Siegfried, MD**
Email (siegfried@vision.wustl.edu)
My research is focused on ocular oxygen metabolism and the development of open-angle glaucoma. We are studying how the oxygen gradient in the eye is altered in disease states as well as noninvasive methods of measuring corneal oxygen consumption.

Florentina Soto, PhD
Email (sotolucasf@vision.wustl.edu)
Studies in my laboratory aim to identify the molecular basis of dendrites and axons lamination and synapse formation during development and in the adult retina. In addition, we investigate how these molecules could be involved in the development of retinal pathologies including retinal degeneration.

Larry Tychsen, MD
2S89 Eye Clinic, St. Louis Children's Hospital
Phone: 314-454-6026
Principal investigator on NIH-funded studies of visual brain maldevelopment and repair in infant primates, as well as clinical studies of visuomotor abnormalities in cerebral palsy and pediatric refractive surgery.

Gregory P. Van Stavern, MD
Email (vanstaverng@vision.wustl.edu)
Neuroimaging of the visual pathways, Idiopathic Intracranial Hypertension, evidence-based medicine and clinical decision making; using the visual system as a model to study neurologic disorders.

A further description of research labs can be found on the Vision Core Researchers webpage (http://vrcore.wustl.edu/residentstudentresearchopportunities/RSROHome).

Faculty

Pediatric Ophthalmology Director
R. Lawrence Tychsen, MD

Adult Ophthalmology Clinical Director
P. Kumar Rao, MD

Ophthalmology Research Director
Peter Lukasiewicz, PhD

Ophthalmology Education Director
Susan Culican, PhD, MD

Ophthalmology Director of Translational Research
Rajendra Apte, MD, PhD

Visit our website for more information about our faculty (http://ophthalmology.wustl.edu/Faculty) and their appointments.

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Daniel Kerschensteiner, MD  
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OD Indiana University Bloomington 1979  
BS Indiana University Bloomington 1977

Vivian Marie Kloke, OD  
Adjunct Instructor in Ophthalmology and Visual Sciences (primary appointment)  
BS Mckendree College 1986
<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Department</th>
<th>Year of Appointment</th>
<th>University or College</th>
<th>Degree(s)</th>
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<tbody>
<tr>
<td>John F. Hardesty, MD</td>
<td>Department of Ophthalmology and Visual Sciences</td>
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<tr>
<td>Harry L Knopf, MD</td>
<td>Professor of Clinical Ophthalmology and Visual Sciences</td>
<td>University of Missouri 1990</td>
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<tr>
<td>Ronald Joseph Knox, OD</td>
<td>Adjunct Instructor in Ophthalmology and Visual Sciences</td>
<td>School Not Listed 1956</td>
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<tr>
<td>Michael S Korenfeld, MD</td>
<td>Assistant Professor of Clinical Ophthalmology and Visual Sciences</td>
<td>University of Arizona 1981</td>
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<tr>
<td>Thomas Errol Kraemer, OD</td>
<td>Adjunct Instructor in Ophthalmology and Visual Sciences</td>
<td>Millikin University 1968</td>
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<tr>
<td>Michael J Lachtrup, OD</td>
<td>Assistant Professor of Ophthalmology and Visual Sciences</td>
<td>Webster University 1980</td>
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<tr>
<td>Robert Louis Lamberg, MD</td>
<td>Associate Professor of Clinical Ophthalmology and Visual Sciences</td>
<td>University of Illinois 1972</td>
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<tr>
<td>Paul Arthur Lapoint, OD, AA</td>
<td>Adjunct Instructor in Ophthalmology and Visual Sciences</td>
<td>School Not Listed 1963</td>
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<tr>
<td>Steven F Lee, MD</td>
<td>Instructor in Clinical Ophthalmology and Visual Sciences</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Scott W Lewis, BS1, OD</td>
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<td></td>
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</tr>
<tr>
<td>John T Lind, MD, MS</td>
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<td></td>
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</tr>
<tr>
<td>Anthony J Lubniewski, MD</td>
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<td></td>
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</tr>
<tr>
<td>Mary Kay Migneco, OD, BS1</td>
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<td></td>
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<tr>
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</tbody>
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Instructor in Clinical Ophthalmology and Visual Sciences (primary appointment)

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MD New York University 2007

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OD University of Missouri 1990
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BA University of CA San Diego 1991

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MD University of Miami 1988
MS University of Bombay 1975
BS University of Bombay 1972
PHD Virginia Tech 1980

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BS Valparaiso Universty 1983

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MD Washington Univ in St. Louis 1963

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BA Williams College 1986
MD University of Utah 1991

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MD Washington Univ in St. Louis 1966
BS Lamar University 1962

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BS Davidson College 2008

S

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MD Saint Louis University 2005
BS Saint Louis University 2001

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BS Illinois College of Optometry 1957
BS1 Washington Univ in St. Louis 2000
OD Illinois College of Optometry 1957

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BA University of Missouri 1971

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BS Washington Univ in St. Louis 1981
MD Washington Univ in St. Louis 1986

Alan Shiels, PHD
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Professor of Genetics
PHD University of London 1983
BS School Not Listed 1979

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MD Saint Louis University 1978
BA Washington Univ in St. Louis 1974

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MD University of MO Kansas City 1989
BA University of MO Kansas City 1989

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OD School Not Listed 1957
BS School Not Listed 1957

Morton Edward Smith, MD
Professor Emeritus of Ophthalmology and Visual Sciences (primary appointment)
Associate Dean Emeritus for Post-Graduate Education
Lecturer in Ophthalmology and Visual Sciences
Lecturer in Pathology and Immunology
MD University of Maryland 1960
BS University of Maryland 1956

Bradley Thomas Smith, MD
Instructor in Clinical Ophthalmology and Visual Sciences (primary appointment)
MD University of AL Birmingham 2002

Claud Randall Snowden, OD
Adjunct Instructor in Ophthalmology and Visual Sciences (primary appointment)
OD Illinois College of Optometry 1974
BS Illinois College of Optometry 1972

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BA Kansas State University 1976
MD Washington Univ in St. Louis 1980

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MD Washington Univ in St. Louis 2012
BE Vanderbilt University 2008
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MBA Southern III Univ Edwardsville 1988
BS School Not Listed 1953
OD School Not Listed 1954

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OD Illinois College of Optometry 1978

Kenneth V Swanson
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MD State Univ of NY Stonybrook 1991
PHD State Univ of NY Stonybrook 1990
BS Mass Inst of Technology (MIT) 1981

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MD Harvard University 1991
BS Harvard University 1977

Linda Mei-Lin Tsai, MD
Professor of Ophthalmology and Visual Sciences (primary appointment)
BA Northwestern University 1990
MD Northwestern University 1995

Robert Lawrence Tychsen, MD
Professor of Ophthalmology and Visual Sciences (primary appointment)
John F Hardesty MD Distinguished Professor of Ophthalmology and Visual Sciences
Professor of Neuroscience
Professor of Ophthalmology and Visual Sciences in Pediatrics
MD Georgetown University 1979
BS Georgetown University 1975

Gregory Paul Van Stavern, MD
Professor of Ophthalmology and Visual Sciences (primary appointment)
Professor of Neurology
BS La Salle University 1989
Courses

Curriculum courses for Ophthalmology and Visual Sciences are listed below (p. 13).


First Year

Introduction to clinical ophthalmology begins in the first year with a lecture and practicum (peer exam) on taking an ocular history and performing an ocular exam. Emphasis is on ophthalmoscopy. Lectures and practicum session will be led by Dr. John Lind and Dr. Morton Smith.

Second Year

During the second year, students will receive a refresher lecture and lab on direct ophthalmoscopy as well as a lecture on ophthalmic manifestations of systemic disease and primary ocular diseases.

Third Year

Third-Year Clerkship Opportunities

In the third year, students are given the opportunity to spend four weeks of their surgery rotation on the ophthalmology service. The students work closely with the ophthalmology residents and review the differential diagnosis of the "red eye," how to interpret an ophthalmologic consult note, and how to handle ocular emergencies. During this rotation, there is again emphasis on the use of the ophthalmoscope. Additional clinical skills introduced to student rotators include the use of the slit lamp and indirect ophthalmoscopy. All third-year students must complete the "Case Studies in Ophthalmology for Medical Students" and attend the periodic "feedback/oral exam" session with Dr. John Lind and/or Dr. Morton Smith.

Third Year/Fourth Year

Ophthalmology Sub-Internship Rotation ("The Sub-Eye"). During the month of June prior to fourth year, students interested in pursuing a career in ophthalmology are encouraged to rotate on this intensive four-week rotation. Students will have personal indirect ophthalmoscopy lenses available for use on the rotation. Formal didactics and workshops will be used to teach students how to perform a detailed ophthalmic history and exam including mastery of advanced slit lamp techniques and indirect fundoscopy. There will be an intense schedule of both live and recorded lectures delivered by ophthalmology faculty members with post-lecture quizzes. Students will be expected to
perform daily required reading. Retention and understanding of reading materials will be gauged by frequent quizzes. Students are strongly encouraged to present a case at the department's Grand Rounds. By the end of the rotation, students will be expected to function at the level of a first-year ophthalmology resident.

Curriculum Courses

M50 Ophth 801 Ophthalmology
This elective is for senior students who plan to apply for a residency in Ophthalmology. In accordance with any sub-internship, medical students will be expected to function at the level of a beginning first-year ophthalmology resident on this rotation. The students will rotate through the resident eye clinic and the subspecialty clinics of the full time faculty of the Washington University Medical School Department of Ophthalmology and Visual Sciences (e.g., neuro-ophthalmology service, cornea/external disease service, etc.). The first day of the rotation will consist of an orientation day in which students will receive extensive didactics and participate in workshops to learn the basics of a complete ophthalmic history and examination. Students may opt to check-out indirect ophthalmoscopy lenses that may be used for the month to facilitate the acquisition of fundoscopy skills. During the rotation, the student's responsibilities range from observation (including observing surgery) to working at a resident level and completing full eye examinations. There will be a rigorous academic curriculum for the rotation including a weekly case presentation, bi-monthly wet lab sessions with a resident, weekly attendance at grand rounds, and a mix of medical student-oriented and resident-oriented conferences. On day one, students will receive a rotating call schedule for the entire month. A medical student is expected to be present at all times to assist the primary call ophthalmology resident during the rotation. By the end of the four-week rotation, the student is expected to be proficient in taking an ocular history and performing a complete eye exam including slit lamp biomicroscopy and indirect ophthalmoscopy.

M50 Ophth 816 Away Rotation in Ophthalmology
This four-week elective is for senior students from medical schools across the United States who are in good standing at their home institution and who are planning to apply for a residency in ophthalmology. The students will rotate through the resident eye clinic and the subspecialty clinics of the full time faculty of the Washington University Medical School Department of Ophthalmology and Visual Sciences (e.g., neuro-ophthalmology service, cornea/external disease service, etc.). In exchange for a refundable deposit, students may opt to check-out indirect ophthalmoscopy lenses that may be used for the month to facilitate the acquisition of fundoscopy skills. During the rotation, the student's responsibilities range from observation (including observing surgery) to working at a resident level and completing full eye examinations. Didactics will include weekly case presentation sessions to Dr. John Lind or Dr. Morton Smith, weekly attendance at grand rounds, and a mix of medical student-oriented and resident-oriented conferences. Also, there will be medical student-oriented workshops to learn the basics of the slit lamp and indirect ophthalmoscopy. On day one, students will receive a schedule of conferences that they are expected to attend during the month. By the end of the four-week rotation, the student is expected to be proficient in taking an ocular history and performing a complete eye exam including slit lamp biomicroscopy and indirect ophthalmoscopy. The final grade of the student is determined by the course director with input from the residents, fellows, and faculty members of the particular service(s) through which the student rotated.

M50 Ophth 900 Research Elective - Ophthalmology
Research opportunities may be available. If interested, please contact the Department of Ophthalmology.